Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL QUALITY MEASURES CLEARINGHOUSE

General

Title

Accidental puncture or laceration: percentage of accidental punctures or lacerations during a procedure per 1,000 discharges for patients ages 18 years and older.

Source(s)

AHRQ QI research version 5.0. Patient safety indicator 15 technical specifications: accidental puncture or laceration rate. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 2 p.

National Quality Forum measure information: accidental puncture or laceration rate (PSI 15). Washington (DC): National Quality Forum (NQF); 2013 Jul 2. 15 p.

Measure Domain

Primary Measure Domain

Clinical Quality Measures: Outcome

Secondary Measure Domain

Does not apply to this measure

Brief Abstract

Description

This measure is used to assess the percentage of accidental punctures or lacerations during a procedure per 1,000 discharges for patients ages 18 years and older.

Rationale

This indicator is intended to flag cases of complications that arise due to technical difficulties in medical care, specifically those involving an accidental puncture or laceration.

The rationale for this measure is that these injuries have adverse consequences for patients, and are often preventable.

Evidence for Rationale

National Quality Forum measure information: accidental puncture or laceration rate (PSI 15). Washington (DC): National Quality Forum (NQF); 2013 Jul 2. 15 p.

Primary Health Components

Patient safety; accidental puncture or laceration

Denominator Description

Surgical and medical discharges for patients ages 18 years and older. Surgical and medical discharges are defined by specific Diagnosis-Related Group (DRG) or Medicare Severity (MS)-DRG codes.

See the related "Denominator Inclusions/Exclusions" field.

Numerator Description

Discharges, among cases meeting the inclusion and exclusion rules for the denominator, with any secondary International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes for accidental puncture or laceration during a procedure

See the related "Numerator Inclusions/Exclusions" field.

Evidence Supporting the Measure

Type of Evidence Supporting the Criterion of Quality for the Measure

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

Additional Information Supporting Need for the Measure

Compared to other patient safety indicators (PSI), the four year trend for this quality indicator (QI) was consistent, and it was one of the most frequent QI in a sample of Veteran's Administration data, with risk-adjusted rate of 4.29 per 1,000 eligible patients in Fiscal Year (FY) 2004 (Rosen et al., 2006). Similar findings have been reported by community hospitals in the Healthcare Cost and Utilization Project, with a risk-adjusted rate of 2.83 per 1,000 eligible patients in 2008. About 16,533 of these events are estimated to have occurred in U.S. community hospitals in 2008. International data from the Organization for Economic Cooperation and Development show substantial variation across countries, with a maximum rate of 4.03 per 1,000 eligible patients from Canada (Drösler et al., 2012).

Cases from the Nationwide Inpatient Sample that were flagged by this PSI had 2.2% excess mortality, 1.3 days of excess hospitalization, and $8,300 in excess hospital charges, relative to carefully matched controls that were not flagged (Zhan & Miller, 2003). This finding was confirmed in the Veterans Affairs hospital system, where cases that were flagged by this PSI had 3.2% excess mortality, 1.4 to 3.1 days of excess hospitalization, and $3,359 to $6,880 in excess hospital costs, relative to carefully matched controls that were not flagged (Rivard et al., 2008). In another study based on State Inpatient Databases from seven states that permit linkage of serial hospitalizations, this indicator was associated with relative risk ratios of 1.52 for inpatient death, 1.16 for readmission within three months, and 1.25 for readmission within one month (after adjusting for age, gender, payer, comorbidities, and specific surgical

Diagnosis-Related Groups [DRGs], and All-Patient Refined [APR]-DRG severity levels) (Friedman et al., 2009).

Evidence for Additional Information Supporting Need for the Measure

DrÃ¶sler SE, Romano PS, Tancredi DJ, Klazinga NS. International comparability of patient safety indicators in 15 OECD member countries: a methodological approach of adjustment by secondary diagnoses. Health Serv Res. 2012 Feb;47(1 Pt 1):275-92. PubMed

Friedman B, Encinosa W, Jiang HJ, Mutter R. Do patient safety events increase readmissions?. Med Care. 2009 May;47(5):583-90. PubMed

National Quality Forum measure information: accidental puncture or laceration rate (PSI 15). Washington (DC): National Quality Forum (NQF); 2013 Jul 2. 15 p.

Rivard PE, Luther SL, Christiansen CL, Shibei Zhao, Loveland S, Elixhauser A, Romano PS, Rosen AK. Using patient safety indicators to estimate the impact of potential adverse events on outcomes. Med Care Res Rev. 2008 Feb;65(1):67-87. PubMed

Rosen AK, Zhao S, Rivard P, Loveland S, Montez-Rath ME, Elixhauser A, Romano PS. Tracking rates of Patient Safety Indicators over time: lessons from the Veterans Administration. Med Care. 2006 Sep;44(9):850-61. PubMed

Zhan C, Miller MR. Excess length of stay, charges, and mortality attributable to medical injuries during hospitalization. JAMA. 2003 Oct 8;290(14):1868-74. PubMed

Extent of Measure Testing

Reliability Testing

Data/Sample. Consists of approximately 30 million adult discharges and 4,000 hospitals ("Healthcare Cost and Utilization Project [HCUP] State Inpatient Databases [SID]," 2008).

Analytic Method. The signal to noise ratio is the ratio of the between hospital variance (signal) to the within hospital variance (noise). The formula is signal/(signal + noise). The ratio itself is only a diagnostic for the degree of variance in the risk-adjusted rate systematically associated with the provider. Therefore, what matters is the magnitude of the variance in the "smoothed" rate (that is, the variance in the risk-adjusted rate after the application of the univariate shrinkage estimator based on the signal ratio).

Testing Results. What the data demonstrate is systematic variation in the provider level rate of 1.136 to 5.075 per 1,000 from the 5th to 95th percentile after a signal ratio of 0.818 is applied as the shrinkage estimator (that is, after accounting for variation due to random factors).

Validity Testing

Data/Sample. The first study (Kaafarani et al., 2011) examined the criterion validity, specifically the positive predictive value (PPV), of 12 selected Patient Safety Indicators (PSIs) using clinical data abstracted from the Veterans Health Administration (VA) electronic medical record (EMR) as the gold standard. The second study (Utter et al., 2009) recruited hospitals for participation in the Validation Pilot Project through the AHRQ Quality Indicators (QI) technical support listserv and conducted web-based informational sessions to introduce the study and outline expectations of participants. Participation was voluntary and without compensation. We asked participants to commit to test the *Accidental Puncture or Laceration* indicator as well as four other PSIs included in Phase I of the Validation Pilot Project. The 47

participating hospitals from 29 states included a spectrum of different sizes, ownership types, and academic affiliations.

Analytic Method. Calculation of the PPV, which is defined as the percentage of reported events that are confirmed as true events based upon application of a "criterion (gold) standard." Sensitivity is defined as the percentage of all eligible events (based upon the same criterion standard) that are reported by hospitals in the administrative data set used for validation. In the cited studies, the criterion standard was based on review of randomly sampled medical records by a trained nurse abstractor, using a standard data collection tool and guidelines, with secondary review of clinical details by an academic surgeon. Confidence intervals (CI) (95%) were estimated with adjustment for clustering of observations within hospitals, as appropriate.

A structured review of each indicator was undertaken to evaluate the face validity (from a clinical perspective) of the indicators. Specifically, the panels approach sought to establish consensual validity, which "extends face validity from one expert to a panel of experts who examine and rate the appropriateness of each item..." The methodology for the structured review was adapted from the RAND/UCLA Appropriateness Method and consisted of an initial independent assessment of each indicator by clinician panelists using an initial questionnaire, a conference call among all panelists, followed by a final independent assessment by clinician panelists using the same questionnaire. The panel process served to refine definitions of some indicators, add new measures, and dismiss indicators with major concerns from further consideration.

Testing Results. The two studies estimated a nominal PPV—i.e., considering even minor complications that did not require repair as true events—of 85% (95% CI, 77% to 91%) and 91% (95% CI, 88% to 94%), respectively. The VA study (Kaafarani et al., 2011) assessed the interrater reliability between chart abstractors and reported an estimate of 97%. However, if such minor complications were classified as false positive cases, the estimated PPV of the indicator in the two studies decreased to 79% and 68%, respectively. A large proportion of all flagged cases (76%) in the second study involved some form of repair of the unintentionally damaged structure. A smaller percentage (4%) required a separate return to the operating room because the injury was not recognized during the initial procedure. Although precise proportions were difficult to estimate, many of the true-positive cases may not have been preventable because scar tissue or adhesions were associated with 25% to 40% of cases and because the goals of the operation in some cases (e.g., tumor-free margin of excision of a malignant lesion or emergency control of hemorrhage) may have warranted an increased risk of unintentional damage to other structures.

False positive rates were low in both of these studies. Some false positives were due to complications that were actually present on admission (i.e., 6 of 17 false positives in the VA study, 5 of 23 false positives in the AHRQ study), which would automatically be excluded by users with "present on admission" (POA) data. Adjusting for the availability of POA data, estimated PPVs are 90% from the VA and 93% from the AHRQ study. The remaining false positives were either non-accidental injuries (e.g., deliberate disruption of tissue to achieve surgical goals) or injuries unrelated to a puncture or laceration (e.g., bleeding, dislodgement of a tube or device).

Refer to the original measure documentation for additional measure testing information.

Evidence for Extent of Measure Testing

Healthcare Cost and Utilization Project (HCUP) State Inpatient Databases (SID). Rockville (MD): Agency for Health Research and Quality (AHRQ); 2008.

Kaafarani HM, Borzecki AM, Itani KM, Loveland S, Mull HJ, Hickson K, Macdonald S, Shin M, Rosen AK. Validity of selected Patient Safety Indicators: opportunities and concerns. J Am Coll Surg. 2011 Jun;212(6):924-34. PubMed

National Quality Forum measure information: accidental puncture or laceration rate (PSI 15).

Washington (DC): National Quality Forum (NQF); 2013 Jul 2. 15 p.

Utter GH, Zrelak PA, Baron R, Tancredi DJ, Sadeghi B, Geppert JJ, Romano PS. Positive predictive value of the AHRQ accidental puncture or laceration patient safety indicator. Ann Surg. 2009 Dec;250(6):1041-5. PubMed

State of Use of the Measure

State of Use

Current routine use

Current Use

not defined yet

Application of the Measure in its Current Use

Measurement Setting

Hospital Inpatient

Professionals Involved in Delivery of Health Services

not defined yet

Least Aggregated Level of Services Delivery Addressed

Single Health Care Delivery or Public Health Organizations

Statement of Acceptable Minimum Sample Size

Does not apply to this measure

Target Population Age

Age greater than or equal to 18 years

Target Population Gender

Either male or female

National Strategy for Quality Improvement in Health Care

National Quality Strategy Aim

Better Care

National Quality Strategy Priority

Health and Well-being of Communities
Making Care Safer

Institute of Medicine (IOM) National Health Care Quality Report Categories

IOM Care Need

Getting Better

Staying Healthy

IOM Domain

Safety

Data Collection for the Measure

Case Finding Period

User may specify the time window; generally one calendar year.

Denominator Sampling Frame

Patients associated with provider

Denominator (Index) Event or Characteristic

Institutionalization

Patient/Individual (Consumer) Characteristic

Denominator Time Window

not defined yet

Denominator Inclusions/Exclusions

Inclusions
Surgical and medical discharges, for patients ages 18 years and older. Surgical and medical discharges are defined by specific Diagnosis-Related Group (DRG) or Medicare Severity (MS)-DRG codes.

Note: Refer to the appendices of the original measure documentation for DRG and MS-DRG codes.

Exclusions
Exclude cases:

- With a principal International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis code (or secondary diagnosis present on admission) for accidental puncture or laceration during a procedure
- With any-listed ICD-9-CM procedure codes for spine surgery
- Major Diagnostic Categories (MDC) 14 (pregnancy, childbirth, and puerperium)
- With missing gender (SEX=missing), age (AGE=missing), quarter (DQTR=missing), year (YEAR=missing), or principal diagnosis (DX1=missing)

Exclusions/Exceptions

not defined yet

Numerator Inclusions/Exclusions

Inclusions
Discharges, among cases meeting the inclusion and exclusion rules for the denominator, with any secondary International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis codes for accidental puncture or laceration during a procedure

Note: Refer to the original measure documentation for ICD-9-CM codes.

Exclusions
Unspecified

Numerator Search Strategy

Institutionalization

Data Source

Administrative clinical data

Type of Health State

Adverse Health State

Instruments Used and/or Associated with the Measure

Unspecified

Computation of the Measure

Measure Specifies Disaggregation

Does not apply to this measure

Scoring

Rate/Proportion

Interpretation of Score

Desired value is a lower score

Allowance for Patient or Population Factors

not defined yet

Description of Allowance for Patient or Population Factors

The predicted value for each case is computed using a hierarchical model (logistic regression with hospital random effect) and covariates for gender, age, modified Centers for Medicare & Medicaid Services (CMS) Diagnosis-Related Group (DRG), transfer status, procedure day availability, and the Agency for Healthcare Research and Quality (AHRQ) Comorbidity category. The reference population used in the regression is the universe of discharges for states that participate in the Healthcare Cost and Utilization Project (HCUP) State Inpatient Data (SID) for the years 2008, a database consisting of 42 states and approximately 30 million adult discharges. The expected rate is computed as the sum of the predicted value for each case divided by the number of cases for the unit of analysis of interest (i.e., hospital). The risk adjusted rate is computed using indirect standardization as the observed rate divided by the expected rate, multiplied by the reference population rate.

Refer to the original measure documentation for a list of covariates used in this measure.

Standard of Comparison

not defined yet

Identifying Information

Original Title

PSI 15: accidental puncture or laceration rate.

Measure Collection Name

Agency for Healthcare Research and Quality (AHRQ) Quality Indicators

Measure Set Name

Patient Safety Indicators

Submitter

Agency for Healthcare Research and Quality - Federal Government Agency [U.S.]

Developer

Agency for Healthcare Research and Quality - Federal Government Agency [U.S.]

Funding Source(s)

Agency for Healthcare Research and Quality (AHRQ)

Composition of the Group that Developed the Measure

The Agency for Healthcare Research and Quality (AHRQ) Quality Indicator (QI) measures are developed by a team of clinical and measurement experts in collaboration with AHRQ. The AHRQ QIs are continually updated as a result of new research evidence and validation efforts, user feedback, guidance from the National Quality Forum (NQF), and general advances in the science of quality measurement.

Financial Disclosures/Other Potential Conflicts of Interest

None

Endorser

National Quality Forum - None

NQF Number

not defined yet

Date of Endorsement

2015 Jan 5

Measure Initiative(s)

Hospital Compare

Adaptation

This measure was not adapted from another source.

Date of Most Current Version in NQMC

2015 Mar

Measure Maintenance

Measure is reviewed and updated on a yearly basis

Date of Next Anticipated Revision

Spring 2016 (version 6.0, including International Classification of Diseases, Tenth Revision, Clinical Modification [ICD-10-CM] and International Classification of Diseases, Tenth Revision, Procedure Coding System [ICD-10-PCS] compatible software)

Measure Status

This is the current release of the measure.

This measure updates previous versions:

AHRQ QI. Patient safety indicators #25: technical specifications. Accidental puncture or laceration rate [version 4.4]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2012 Mar. 1 p.
AHRQ quality indicators. Patient safety indicators: technical specifications [version 4.4]. Appendices. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2012 Mar. 79 p.

Measure Availability

Source available from the Agency for Healthcare Research and Quality (AHRQ) Quality Indicators (QI) Web site .

For more information, contact the AHRQ QI Support Team at E-mail: QIsupport@ahrq.hhs.gov; Phone: 301-427-1949.

Companion Documents

The following are available:

AHRQ quality indicators. Patient safety indicators (PSI) parameter estimates [version 5.0]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 95 p. This document is available from the AHRQ Quality Indicators Web site .
AHRQ quality indicators. Patient safety indicators benchmark data tables [version 5.0]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 15 p. This document is available from the AHRQ Quality Indicators Web site .
AHRQ quality indicators. Patient safety quality indicators composite measure workgroup. Final report. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2008 Mar. various p. This document is available from the AHRQ Quality Indicators Web site .
HCUPnet: a tool for identifying, tracking, and analyzing national hospital statistics. [Web site]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); [accessed 2015 Sep 10]. HCUPnet is available from the AHRQ Web site .

NQMC Status

This NQMC summary was completed by ECRI on October 1, 2003. The information was verified by the measure developer on October 29, 2003.

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This NQMC summary was updated by ECRI Institute on January 2, 2013 and again on November 20, 2015. The information was verified by the measure developer on January 19, 2016.

Copyright Statement

No copyright restrictions apply.

Production

Source(s)

AHRQ QI research version 5.0. Patient safety indicator 15 technical specifications: accidental puncture or laceration rate. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2015 Mar. 2 p.

National Quality Forum measure information: accidental puncture or laceration rate (PSI 15). Washington (DC): National Quality Forum (NQF); 2013 Jul 2. 15 p.

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